to the company's final target of 15%. Motorola estimates that much of the additional $2 billion in the plan could come from debt securities and loans.

Iridium's attractions are impressive. It provides ubiquitous global phone service at a premium price with little or no dependence on local terrestrial facilities. In times of disaster or political crisis, or in places with sparse or unreliable local service, the system can route calls among the 66 satellites in space bypassing all infrastructure on the ground. For an elite of government officials and corporate figures operating in remote areas, the availability of Iridium should be worth the money. A bold and visionary concept when it emerged in 1987 from a team in the company's satellite systems engineering group, it endows many regions of the earth with voice and limited data communications for the first time. For example, it actually focuses on polar domains, such as parts of Siberia, poorly served by other satellite systems. Kazuo Inamori, the venerable chairman of Kyocera, also believes that Iridium will be popular in the 60% of territorial Japan not currently covered by cellular.

"Give Us Spectrum, Let Others Fight"

NONETHELESS, BEYOND the bold and ingenious concept (Daggatt calls Iridium "the real pioneer of LEOs"), the system suffers from technical flaws. Were it not for Globalstar, perhaps these flaws would not have become evident until after the 66 birds were aloft. A far simpler and cheaper solution, Globalstar uses 48 satellites with no links between them. Each functions as a "bent pipe" transponder, receiving signals from a phone on the ground and passing them back to any gateway within the satellite's 1,500-mile-wide footprint, linked to locally available telephone networks. Because Globalstar uses local phone systems rather than bypassing them, the system has been able to raise a total of some $300 million in support from Alcatel, France Telecom, Vodafone (serving the United Kingdom, Australia and Hong Kong), Airtouch-U S West, Hyundai and DACOM in Korea, Deutsche Aerospace and Alenia.

This amount may seem small beside the billion raised by Iridium. But Globalstar has capital costs (at $1.8 billion) one-half Iridium's, circuit costs one-third Iridium's, and terminal costs (at [illegible] each) one-fourth Iridium's. With no intelligence in space, Globalstar relies entirely on the advance of intelligent phones and portable computer devices on the ground; it is the Ethernet of satellite architectures. Costing one-half as much as Iridium, it will handle nearly 20 times more calls.

The advantages of Globalstar stem only partly from its avoidance of complex intersatellite connections and use of infrastructure already in place on the ground. More important is its avoidance of exclusive spectrum assignments. Originating several years before spread-spectrum technology was thoroughly tested for cellular phones, Iridium employs time division multiple access, an obsolescent system that requires exclusive command of spectrum but offers far less capacity than code division multiple access.

Like conventional cellular or radio transmissions that differentiate signals by time slot or frequency, TDMA sharply restricts the reuse of spectrum in nearby cells. By contrast, CDMA is a form of spread-spectrum communications that differentiates signals by a spreading code and allows the use of the same frequencies all the time, everywhere. Just as you can reduplicate wireline spectrum merely by laying another fiber, you can now manufacture new spectrum in the air merely by breaking large cells into smaller ones.

Among some six companies seeking low earth orbit satellite approval from the FCC in 1993, only Iridium used TDMA, requiring national and international bodies to pick it as a winner from the outset and assign it exclusive spectrum. By contrast, in a majority report issued to the FCC on April 6, 1993, CDMA companies in the U.S., including TRW, Loral-Qualcomm, Celsat and American Mobile Satellite, could all agree to share spectrum and let the market choose winners. A Motorola lawyer explained to Space News, "Give us the spectrum and let the others fight for whatever's left." In the face of alternatives with no need for exclusive spectrum allocations, Iridium could fly only if it offered radically superior performance or capacity. But TDMA dooms it to generally inferior performance and capacity.

Unlike TDMA systems, which can "see" only one satellite signal at a time, CDMA handsets have "path" diversity, using "rake receivers" that can combine a number of weak signals into an intelligible stream. Iridium and other TDMA systems compensate by using more power. But no practical amount of power can propel a satellite signal through a tin roof. And excess power means larger handsets or heavier satellites. Iridium satellites together use 80% more power than Globalstar's, yet employ antennas nearly twice as large and offer 18.2 times less capacity per unit area.

Teledesic also suffers from the use of TDMA. But Teledesic's T-1 capabilities would compensate with 100,000 times more bandwidth and with a bit error rate that can accommodate the new fiber standards such as SONET-ATM (synchronous optical network/asynchronous transfer mode), which send packets without retransmission. The issue is whether these features can justify the political, financial, and performance costs of using a modulation scheme—TDMA—that severely limits spectrum sharing and path diversity.

So what is this, another saga of hubris on the information super-highway—to go with the Raymond Smith-John Malone follies? Perhaps good new ideas are harder to come by as company revenues grow into the billions, and Gates and McCaw disinvest and diversify as fast as they can from their increasingly cumbrous vessels of wealth. Having

	Teledesic	Spaceway	Winner and Loser
Number of Satellites	840	Nine to 17	More satellites mean more potential bandwidth: Teledesic
Cost of System	$9 billion	$3.2 billion to $6 billion	Spaceway offers more for less with current technology
Altitude	435 miles	22,300 miles	Spaceway the mainframe of satellites, Teledesic into the microcosm.
Spectrum Request	One Gigahertz in Ka band (19-30 GHz)	2.5 GHz in Ka band up and down—entire international allocation for fixed satellite service.	Both Spaceway and Teledesic require exclusive spectrum. But Spaceway wants it all.
Money Raised to Date	$20 million	In-house project	Spaceway is a part of GM (Giant Money).
Airtime Charge per Minute	Four cents/minute for basic channel	$6 for 30-minute teleconference	Teledesic and Spaceway offer broadband at low price.
Terminal Cost	$1,000 for 64 kbps, 2 mbps $6,000-8,000	Under $1,000	
Uses	Fixed broadband service for computer data and video teleconferencing at up to [illegible] rates (16 Kbps to 2,048 Mbps)	Fixed broadband service similar to Teledesic.	Teledesic and Spaceway focus on computer market, but Spaceway is [illegible] to Clarke belt of 22,300 miles.
Antenna Size	10 in.	20 in.	The higher the frequency the smaller the antenna. Teledesic wins in the Ka band because of low earth orbit.
Expandability	Will expand with the advance of microchip technology. Currently limited by orbital switching capacity.	Can be expanded with launch of more satellites, but limited by constraints of geostationary orbit.	Teledesic offers best expandability.
Launch Weight	1,700 lbs	3,785 lbs (spacecraft; launch weight 7,[illegible] lbs.	Hughes wins the orbital shotput; Teledesic the lowest orbit.
Spectrum Sharing	No	No	TDMA requires spectrum exclusivity, though can share by segmentation
Modulation Scheme	FDMA/TDMA	FDMA/TDMA (unsettled)	
Spectrum Band Used	Ka band (19-30 gigahertz)	Ka band	Ka band allows smaller antennas, lower power, and more bandwidth.
Regulatory Advantage	Ability to conform to national boundaries and huge bandwidth benefits for Third World.	Geostationary satellites currently gain from exclusive spectrum priority over LEOs in International Telecommunications Union regs.	Hughes is in driver's seat under current ITU regulations, but may have overdone its demands.
Intersatellite Links	Yes	Yes	
Rollout Date	2001	1998	
Backers	Craig McCaw and Bill Gates	GM-Hughes	It's upstart billionaires vs. the Military Industrial Complex.
Learning Curve			Teledesic is a new technology riding Moore's Law; Spaceway a late iteration of a mature technology of geostationary satellites.
Time to Download Jurassic Park (DSS, MPEG 2)	16.3 minutes using E-1 line (2.048 Mbps), 16 seconds using Gigalink	21.[illegible] hours using T-1 capability (1.544 Mbps)	Try Direct Broadcast Satellite
Cost to Download Jurassic Park	[illegible]	[illegible]	...or cable pay-per-view.
Time and Cost to Download Daily New York Times ([illegible])	[illegible]	Seven seconds, cost not available	The Wall Street Journal would be cheaper and leave out the sports and PC.
Bottom Line: Capacity and Cost	[illegible]	Realistic capacity: 2,500 T-1s	Teledesic designed as ubiquitous broadband system competitive with ground infrastructure. Spaceway is a supplementary system inferior to ground service and more costly.
Law of the Telecosm	Teledesic is designed for the Telecosm. Ubiquitous computer connections.	Spaceway is mainframe of the satellite industry, today's champ but a maturing technology.	Teledesic the big winner; focuses on computer market and benefits from new computer technology.

recently passed the billion-dollar mark in his systematic process of disinvestment from Microsoft—he retains $8 billion or so—Gates at times seemed embarrassed by his link to this gigantic project. He told us it was too early to write about Teledesic.

No, the story is in fact more interesting. Impelled by the onrushing rise in the cost-effectiveness of individual chips compared to multichip systems, the Law of the Microcosm dictates decentralization of all information architectures. During the 1980s, this centrifuge struck the mainframe computer establishment of IBM. During the 1990s, the personal teleputer, summoning and shaping films and files of images from around the world, will collide with the centralized establishments of TV broadcasting. At the end of the century, Teledesic and the other LEOs will usher in the age of decentralization in space.

From this point of view, Gates's participation becomes more readily intelligible. Gates seems always to follow the microcosm wherever it leads. A vision of software for decentralized systems of personal computers informs everything Microsoft does.

In 1994, for example, Microsoft made an investment in Metricom, a wireless terrestrial system that supplies links of up to 56 kilobits per second to portable computers or personal digital assistants. Within cells, the devices can communicate directly with one another; outside the cell, Metricom routes its calls through an expandable mesh of nodes each the size of a shoebox and costing less than $1,000. Based on spread- spectrum technology the system operates at power levels low enough to avoid the need for FCC licenses. Yet it can be expanded to metropolitan-area dimensions.

In many respects, Teledesic is Metricom in the sky. It is focused on computer communications. It routes packets by the most convenient path through a mesh of nodes. It is based on microprocessor technology. Both Teledesic and Metricom plan to employ devices from Motorola's 68000 family.[1] As Gates explains the system: "Some functions are most efficiently performed by large numbers of small processors working together, rather than a few large ones." The entire new generation of low earth orbit satellite systems relies on this centrifugal force of the microcosm.

It was not supposed to happen this way. Just as Grosch's Law of the computer industry implied that computer power rose by the square of the cost, there was a similar law of the satellite industry that held satellite efficiency to be proportional to size. In a popular text, "Communications Satellite Systems," published in 1978, James Martin cited an AT&T study showing that just six satellites could carry all the long-distance traffic from the American continent; no fiber optics would be necessary. "The next major thrust in the space segment should capitalize on the economies of scale which today's technology offers," wrote Martin, urging creation of "massive hardware" as heavy as several tons and "immensely powerful satellites with large antennas beaming as much information as we are capable of using to our rooftops." Many satellite advocates, led by Arthur C. Clarke, viewed with impatient scorn the expensive terrestrial systems that somehow forestalled the manifest destiny of big birds to rule the world of communications.

Bringing the Microcosm to Space

IN 1994, THE BIG-BIRD DREAM still flourishes in Spaceway, the international consortium Inmarsat, and the new launch this summer of direct broadcast satellite technology by Hughes's DirecTV, Hubbard's USSB, TCI's Primestar, and Rupert Murdoch's imperial systems in Europe and Asia. Using centralized satellites in geosynchronous orbits, DBS is the ultimate broadcast medium, reaching billions of potential customers at the cost of reaching hundreds of thousands through cable-TV systems. But these geostationary satellite systems suffer from the same flaws as mainframes: sclerosis by centralization. At a time when customers want the choice, control, convenience and interactivity of computers, the big birds offer one-size-fits-all programming at specified times, with little ability to control the flow or interact with it.

The real showstopper in the long run, though, is a nagging half-second time delay for Clarke orbit signals. Bad enough [illegible], a half-second is near eternity for computer c[illegible], for the living-room and desktop superco[illegible] 2001, a half-second delay would mean gigabytes of information to be stored in buffers. While companies across the country, from Intel to Digital Equipment, are rushing to market with cable modems to allow computer connections to CATV coax, geosatellites remain mostly computer-hostile. Even with the new digital cosmetics of DBS, geosynchronous satellites are a last vestige of centralization in a centrifugal world.

By contrast, Teledesic brings the microcosm to space. Rather than gaining economies of scale from using a few huge satellites, Teledesic gains economies of scale by launching as many small birds as possible. Based on Peter Huber's concept of a geodesic network—a mesh of peers equally spaced apart like the nodes in a geodesic dome—Teledesic is not a hierarchy but a heterarchy. Distributing the system responsibilities among 840 autonomous satellites diminishes the requirements, such as message throughput and power usage, for each one. Building redundancy into the entire constellation, rather than within each satellite, yields higher overall reliability, while reducing the complexity and price of each unit.

As Craig McCaw explains, "At a certain point, redundant systems create more complexity and weight than they are worth. Rather than having each satellite a 747 in the sky with triply redundant systems, we have hundreds of satellites that offer self-redundancy." Eschewing the Hughes philosophy of "every component proprietary to Hughes," Teledesic will manufacture and launch a large number of satellite peers, using off-the-shelf parts whenever possible. This approach also provides economies of scale that, according to a study by brilliant pebbles contractor Martin Marietta, could lower unit costs by a factor of one hundred or more.

Just as microcosmic technology uses infinitesimal low-powered transistors and puts them so close together that they work faster than large high-powered transistors, Teledesic satellites follow the rules of low and slow. Rather than one big powerful bird spraying signals across continents, Teledesic offers 840, programmably targetable at small localities. Just 435 miles out, the delay is measured in milliseconds rather than half-seconds.

The total computing power and wattage of the constellation seems large, as is needed to sustain a volume of some two million connections at a time, four times Spaceway's capacity. But with other link features equal, between 1,226 and 3,545 times more power is needed to communicate with a geostationary satellite than with a LEO.

Perhaps most important, unlike Iridium, TRW's Odyssey, and Globalstar, Teledesic from the outset has targeted the fastest-growing market of the future: communications for the world's 125 million PCs, now growing some 20% a year. And Teledesic has correctly chosen the technology needed to extend computer networks globally—broadband low earth orbit satellites. The real issue is not the future of Teledesic but the future of Iridium.

In the short run Iridium's voice services cannot compete with Globalstar's cheaper and more robust CDMA system. But in the long run Iridium could be trumped by Teledesic. Although Teledesic has no such plans, the incremental cost of incorporating an "L" band transceiver in Teledesic, to perform the Iridium functions for voice, would be just 10% of Teledesic's total outlays, or less than $1 billion (compared with the $3.4 billion initial

And the Winner Is

Globalstar is the easy winner for current offering of mobile phone services under a CDMA regime of spectrum sharing. But Teledesic can add phone services to its broadband computer system. Over time, Teledesic's 840 satellites will outperform Globalstar's 48. Big question: When will microchip technology advance enough to allow broadband applications over CDMA? When that happens, Globalstar has a shot at the grand prize. **Iridium** is both too expensive to compete in mobile phones and too narrowband for data. Today's champ **Spaceway** is maturing. Big winner for the next decade is...**Teledesic.**

capital costs of Iridium). But 840 linked satellites could offer far more cost-effective service than Iridium's 66.

Iridium's dilemma is that the complexities and costs of its ingenious mesh of intersatellite links and switches can be justified only by offering broadband computer services. Yet Iridium is a doggedly narrowband system focused on voice.

Iridium eventually will have to adopt Teledesic's broadband logic and architecture. To protect its global lead in wireless communications and equipment, Motorola should join with Teledesic now, rather than later. Working with Lockheed, Motorola is making impressive gains in satellite-manufacturing technology. Supplying both handsets and space gear for computer networks, Motorola could turn its huge investment of time, money and prestige in Iridium into a dramatic global coup in wireless computer services. As part of a broadband system, Iridium could still become a superb brand name for Motorola. But persisting in a narrowband strategy in the name of avoiding Teledesic's larger initial costs, Motorola's executives will end up inflicting serious strategic costs on the company.

Most of the famous objections to Teledesic are based on ignorance or misinformation. Launch anxieties spring chiefly from the GEO experience. LEOs are 60 times nearer and between a tenth and a third the weight. Teledesic satellites are designed to be hoisted in groups of eight or more. From Great Wall in China to Khrunichev in Russia, companies around the world will soon be competing to supply low-cost launching facilities for the system. Orbital Sciences, an entrepreneurial dervish near Washington's Dulles Airport with some $190 million in revenues, has developed a low-cost method for lofting groups of LEOs from an adapted Lockheed 1011 Tristar.

Other fears are similarly fallacious. Teledesic will work fine in the rain because the high minimum vertical angle (40 degrees) of its satellite links from the ground reduces the portion of the path exposed to water to a manageable level. By contrast, geostationary satellites must operate at eight degrees, passing the signal through a long span of atmosphere. Made of tough new composite materials, Teledesic satellites will endure the kind of debris found in space mostly unscathed. The solar arrays can accept holes without significantly damaging overall performance. All in all, Teledesic's designers expect the birds to remain in orbit for an average of ten years. With most of its key technologies plummeting in price along with the rest of electronic components, the system may well cost even less and perform better than its business plan promises or George Fisher speculates.

Indeed, widely charged with reckless technological presumption, the designers of Teledesic in fact seem recklessly cautious in their assumptions about the rate of microchip progress. For example, their dismissal of CDMA assumes that the high speed of the spreading code functions—requiring digital signal processors that race at least 100 times the data rate—pushes cheap T-1 performance far into the future. Yet in early 1995, Texas Instruments will ship its multimedia video processor, a marvel that combines four 64-bit DSPs, a 32-bit RISC CPU, 50 kilobytes of on-chip memory, a floating-point unit and a 64-bit direct memory access controller all on one chip. This device now performs two billion operations per second and, with an upgrade from 35 megahertz to 50 megahertz clock rate, soon will perform three billion. The estimated cost in 1995 is around $400, or a stunning $133 per bop (current Pentiums charge three times as much for 100 mips). Five years from now, when Teledesic gets serious, that kind of one-chip computing power can implement CDMA for broadband data without any cost penalty. Future generations of CDMA systems may be able to offer, at a dramatically lower price, the same broadband services in *mobile* applications that Teledesic now promises for fixed services only.

Assuming that Teledesic meets the CDMA challenge, the other fear is that terrestrial systems will capture enough of the market to render Teledesic unprofitable. This fear, however, can come true only if governments delay this supremely beneficial system well into the next century.

Unlike the competition, satellite systems can provide global coverage at once. Whether for $9 billion or $90 billion, no terrestrial system will cover the entire world, or even the entire U.S., within decades of Teledesic. As soon as it is deployed, it will profoundly change the geography and topography of the globe. Suddenly the most remote rural redoubt, beach, or mountain will command computer communications comparable to urban corporations today. The system can make teleconferencing, telecommuting, telemedicine, and teleschooling possible anywhere. Gone will be the differences among regions in access to cultural and information resources. People will be able to live and work where they want rather than where corporations locate them.

This change transforms the dimensions of the world as decisively as trains, planes, automobiles, phones and TVs changed them in previous eras. It will extend "universal service" more dramatically than any new law can.

Moreover, Teledesic can eliminate the need to cross-subsidize rural customers. Determining the cost of wireline services are the parameters of population density and distance from the central office. Rural customers now cost between 10 and 30 times as much to serve with wires as urban customers do. Teledesic will bring near-broadband capabilities to everyone in the world at the same price.

Most important, this expansion of the communications frontier will foster the very economic development that will fuel the demand for the service. Today, it does not pay to bring telecommunications to poor countries that might benefit most. Teledesic and other satellite services break the bottleneck of development. Simultaneously opening the entire world, it enriches every nation with new capital exceeding the fruits of all the foreign aid programs of the era.

Teledesic is a venture worthy of McCaw and Gates. In its impact on the world, it may even rival the Herculean contributions of its sponsors in cellular and software. The issue is not the technology or the commitment of the principals. The issue is the readiness of the U.S. government to accommodate this venture. Before Teledesic can be approved internationally, it will have to attain a license from the FCC in the U.S. It has taken four years to approve Iridium. It took 30 years to approve cellular. How long will it take to approve Teledesic?

Currently Teledesic, Iridium and Globalstar face several political obstacles. The International Telecommunications Union's Radio Regulation 2613 gives GEOs absolute priority over LEOs. For Spaceway, Hughes is now demanding an exclusive license for the full five gigahertz available in the Ka-band worldwide, leaving no room for Teledesic or any other Ka-band LEO. Under current law, Hughes or other geo systems could usurp any LEO that was launched.

LEOs are a major American innovation. The U.S. government should take the lead now in spearheading a change in the regulations to accommodate LEOs. This is no minor matter. [illegible] the dimensions and promise of Teledesic loom [illegible] quickly, the Japanese or Europeans are certain to [illegible] proposals. "When they do," Craig McCaw [illegible] they will immediately have their government on [illegible] they will be able to go to the ITU right away. My greatest fear is that we will have the technology all ready, and foreign companies will beat us out because they can get their governments in line."

The U.S. government was on board for Apollo 25 years ago and the U.S. won the first space race. This space race is just as important, but the government is treating it as some sleepy-time infrastructure project. In fact, it is the information superhighway going global and ubiquitous. It is the ultimate promise of the information age," says McCaw.

Sustaining the U.S. Lead in Technology

McCAW EXPLAINS: "It'll mean ecological disaster if China mimics what we did—building more and more urban towers and filling them up with people who queue up every day on turnpikes into the city, emitting fumes into the air, and then building new towers and new highways when you want to move the company, and then digging up the highways to install new wires."

McCaw waves toward the window, out at Lake Washington. "Look at that floating bridge. It took $1.5 billion to cross Lake Washington, then it got busted in a storm. Cross this lake, any lake, any ocean in the world with broadband wireless. That's the promise of Teledesic. All you do is to reconfigure the communications in software at zero incremental cost. No wires for the final connections. It's what we do in Hong Kong and Shanghai, where everyone uses a cellular phone."

President Clinton, Vice President Gore and other members of the administration continually ask what they can do for technology. One thing they can do is vastly streamline the process for approval of communications projects. At the moment, Congress is determined to retain bureaucratic dominance over the most dynamic enterprise and technology in the world economy—what they like to term the information superhighway. They see it as a possible source of congressional power, campaign finance, employment and pelf, like the Baby Bells today or like existing construction projects. Rather than turn telecom into a vast porkbellied poverty program, however, the administration should deregulate the field. Communications companies must be permitted to compete and collaborate wherever the technology leads.

Whether the administration knows it or not, these technologies are its greatest political asset. The high-tech industries unleashed in the 1980s by venture capital and junk bonds are now the prime fuel of the economy of the 1990s. Comprising perhaps 60% of incremental GDP and 48% of exports, the momentous upsurge of computers and communications is even compensating for the mistakes of the Bush and Clinton regimes and making plausible Clinton's continuing claims of economic success. But now Clinton, Gore and FCC Chairman Reed Hundt must make a choice. If they want to maintain this redemptive U.S. lead in technology, they must be willing to forge new alliances in Congress to get the politicians and bureaucrats out of the way of the future. A good start would be to open the floodgates for the global onrush of low earth orbit satellites dedicated to computer communications. If they do, they can help make the world, as McCaw's Alberg puts it, "a truly global Internet in an ever-expanding ethersphere."

ATTACHMENT B

Wireless Cable Allocations/Planned Allocations

[illegible]	[illegible]	[illegible]
Australia	2.076-2.111 GHz 2.300-2.400 GHz	Allocated, Operational Services.
Australia	27.5-29.5 GHz	Possible for allocation in future.
Austria	40.5-42.5 GHz	Allocated, No Operational Services.
Canada	2.596-2.686 GHz	Allocated, Operational Services.
Chile	2.596-2.692 GHz	Allocated, Operational Services
Denmark	40.5-42.5 GHz	May be Allocated in Future
Finland	11.7-12.5 GHz	Allocated, No Operational Services, may be re-assigned.
Finland	17.3 -17.7 GHz	Possible for Future Assignment
France	3.6-3.8 GHz	For Allocation
Germany	40.5-42.5 GHz	Possible for Allocation
Netherlands	40.5-42.5 GHz	Allocated, No Operational Service
Norway	40.5-42.5 GHz	Possible for Allocation
Portugal	40.5-42.5 GHz	Allocated, No Operational Service.
Romania	2.082-2.114 GHz 2.295-2.335 GHz	Allocated, Experimental Service
Romania	12.77-12.93 GHz 28.5-29.5 GHz 38 GHz Band 40.5-42.5 GHz 60 GHz band	Planned for Allocation
Spain	40.5-42.5 GHz	Possible for Allocation
Sweden	17.3, 17.5, 17.7, 17.92 GHz	Allocated to fixed links to complement CATV
Sweden	40.5-42.5 GHz	Allocated, No Operational Service
Switzerland	40.5-42.5 GHz	Allocated, No Operational Service
UK	40.5-42.5 GHz	Allocated, No Operational Service
Uruguay	2.524-2.644 GHz	Allocated, Operational Service to Commence Soon

Source:
Andrew Krieg,
Wireless Cable
Association
International
Inc.
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